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Evaluation of Turkish pediatric voice handicap index in children with asthma

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Abstract

Aim: The purpose of the study was to evaluate the voice quality in children with asthma by subjective methods. Material and Method: Children with mild-to-severe asthma (n=91) and age-sex matched healthy controls (n=79) without present or past history of voice disorders were included in the study. The Turkish version of the Pediatric Voice Handicap Index (pVHI) was used to access the impact on functional, physical, and emotional aspects of voice and oral communication. Results: A significant difference was noted between patients with asthma and controls with regard to pVHI scores. Indicating a greater chance of voice disorders was observed in patients with asthma (P<0.005). The scores of three domains and the total score of pVHI were prevalent in children with asthma. In addition, as the severity of asthma increased, high scores of pVHI were observed (p:0.01). Discussion: Our study showed that children with asthma had higher scores on pVHI compared to healthy children, indicating a greater likelihood of the development of voice complaints. A positive correlation was found between the severity of asthma and pVHI scores

Keywords

Pediatric; Voice Handicap Index; Asthma

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Introduction

Asthma is a common childhood illness and generally associated with numerous multi-morbid disorders [1]. Pediatric dysphonia is common in children and have a negative effect on family and social life. A majority of research suggests that patients with asthma display more voice abnormalities than their healthy peers [2-6]. Many studies have focused on the association between inhaled corticosteroids (ICSs) and voice changes. ICSs can cause local adverse effects in the oral cavity, oropharynx, and larynx such as hoarseness, and pharyngitis [7-9]. In patients with asthma, allergen exposure of the larynx may lead to viscous secretions in the larynx and may cause vocal fold edema and erythema [10]. Gastroesophageal reflux (GER) and nasal polyposis, which are frequently observed in patients with asthma, are other factors that may cause voice disorders [11, 12].

On the other hand, there are also studies which found no relationship between asthma and voice disorders. A past study showed no evidence to suggest that children with asthma suffer more voice disorders than non-asthmatics [13]. A recent study also demonstrated that there was no significant connection between having an asthma diagnosis and having frequently occurring vocal symptoms [6].

There is limited valid and reliable information in objective and subjective studies on voice disorders in asthma and these are based upon studies of the adult population [5]. In addition to objective tests such as acoustic and aerodynamic testing, subjective tests such as voice handicap index can be performed in evaluation voice disorders. The Pediatric Voice Handicap Index (pVHI) is a self-assessment tool for pediatric voice disorders which assigns a numerical value to quantify the parent's perception of the child's functional, physical and emotional disability related to voice use. It has become the most accepted subjective tool in the evaluation of subjective pediatric voice disorders [14].

We hypothesized that asthmatic children might have more subjective voice complaints than non-asthmatic children. It is important to Pediatricians and Otorhinolaryngology (ENT) specialists to identify asthma-related voice disorders in children. Recently, the original Voice Handicap Index has been translated into Turkish and validated the Turkish version for use with the pediatric population [15]. To the best of our knowledge, the Turkish version of the pVHI has not been used in Turkish children with asthma. So the aim of the study was to use the Turkish version of the pVHI in school-age children with asthma and to compare the results with healthy children.

Material and Methods

Participants

A total of 91 children aged 6-17 years with mild-to-severe asthma were enrolled from the Pediatric Allergy Department and invited to attend for a formal voice assessment to Otorhinolaryngology Department between January and September 2017. The diagnosis and severity of asthma were defined according to the Global Initiative for Asthma guidelines [16].

Children were defined as asthmatic according to the following criteria:

a) Recurrent episodes of one symptom of asthma, including cough, wheezing, breathlessness, and chest tightness;

An improvement of at least 12% in base forced expiratory volume in 1 s(FEV1) after bronchodilator use.

Patients receiving concomitant systemic steroids, with active upper respiratory tract infection, gastroesophageal reflux disease, aged < 6 years, or with a history of endotracheal intubation and with cord vocal nodules and polyps that were seen in video laryngoscopy examination were excluded from the study. The demographic data included age, gender, allergen sensitization, asthma severity, asthma medication. The control group consisted of 79 age-and gender-matched children selected from the Pediatric Department without any present or past history of voice disorder, hearing loss or related disability that might affect the child's speech and voice and no signs of atopic disease. The Ethics Committee of our hospital approved the study and written informed consent was given by the parents or legal guardians of the patients (2017-035). All patients underwent video laryngoscopy examination using a flexible Mooncare fiberscope 3.4 mm (8300019728, Germany).

The Pediatric Voice Handicap Index (pVHI)

The pVHI is a self-assessment tool for pediatric voice disorders, which is filled by children's parents and consists of 23 questions divided into functional (7 questions), emotional (7 questions) and physical domains (9 questions). The scores range from 0 to 4 according to the frequentcy of the problem from 0=never to 4=always. Patients with a total score below 20 were considered normal. The parents of each participant in both the study and control groups independently completed the Turkish-pVHI [15].

Statistical analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) ver. 20.0, (SPSS Inc, Chicago, Illinois, USA). Numerical variables were defined as mean ± standard deviation and/or median (min-max), and categorical variables as number and percentage. The normality hypothesis was tested using the Kolmogorov-Smirnov test. For continuous numerical variables, a t-test or Mann-Whitney U test was used to determine whether there was any difference between the experimental and control groups, and for categorical variables, the Chi-Square test. When the experimental group stratified according to the severity of asthma, the intergroup analysis was performed by using the Kruskal-Wallis test. The level of statistical significance was accepted at $p<0.05$.

Results

A total of 91 children with asthma and 79 children in the control group with a mean age of 11.6±3.27 years were recruited into the study. The demographic, clinical and medical characteristics of the patients were seen in Table 1. According to the severity of asthma (GINA 2016), 38 patients (41.8%) were classified as mild asthma, 35 (38.5.%) as moderate asthma and 18 (19.8%) as severe asthma. The mean total Turkish- pVHI score was 13.12±11.81 in the asthma group and 6.43±8.49 in the control group. According to the Mann-Whitney U test, the difference between the mean scores of the three domains and the total score of the Turkish version- pVHI was significant between the two groups ($p<0.005$)(Table2).

The overall mean values for p-VHI total and each domain are shown in Table 2. In the asthmatic group, 6 (6.7%) patients were receiving only montelukast, 49 (54.4%) only ICSc (Flixotide), 19 (21.1%) patients inhale corticosteroids plus montelukast, 4 (4.4%) ICSc+ long-acting ß$_2$ agonist (Fluticasone-Salmeterol).

Twelve (%13.3) of them used salbutamol as required (Table1). There was a significant relationship between asthma severity and the pVHI total score (p:0.01). There was also observed to be a relationship between physical and emotional domains and

asthma severity, but no significant relationship was seen between the functional domain and asthma severity (p=0.006, p=0.001, p= 0.08 respectively) (Table3).

Discussion

There is only very limited information on the subjective evaluation of voice disorders in children with asthma [6]. We hypothesized that children with asthma might have more subjective voice complaints than non-asthma participants. Our study showed that children with asthma had higher scores on pVHI compared to healthy children, indicating a greater likelihood of the development of voice complaints. These results are similar to the findings of two studies with adult studies where the participants with asthma scored significantly higher on voice quality parameters than the control group [16,17]. In addition, patients with allergy have also been reported to have a higher degree of vocal dysfunction measured with VHI than patients without allergy [18]. Our recent study showed that children with allergic rhinitis had more frequent subjective voice disorders measured with pVHI than patients without allergy [19].

In contrast to our study findings, in a cross-sectional, large cohort study to evaluate dysphonia in children, Carding et al. [13] found that although the parental report suggested significant risk factors for dysphonia in asthma, children with asthma were no more likely to be dysphonic than non-asthmatic children. Kallvik et al. [6] demonstrated that although 18.2% of the children with asthma had frequently occurring vocal symptoms, such as throat clearing and coughing, there was no significant connection between asthma diagnosis and frequently occurring vocal symptoms. In these two studies, voice complaints were evaluated subjectively with questionnaires on vocal symptoms not with p-VHI. There are differences in clinician and parental results regarding the symptoms of voice disorders.

In our recent study, we have demonstrated that children with allergic rhinitis show higher scores on pVHI compared to healthy children, indicating a greater chance of voice disorders observed in them. In addition, we showed that pVHI scores were correlated positively with AR severity [19].

Previous studies with adult participants have shown that dysphonia was significantly more prevalent in patients with asthma compared to healthy participitans [5,16,17]. Restricted expiration, decreased lung volume, diaphragm, together with fluctuations in intra-thoracic and intra-abdominal pressures might hypothetically explain the significantly higher prevalence of voice disorders in patients with asthma. Additionally, mucosal changes due to obstructive respiratory disease, accompanying rhinosinusitis, the influence of laryngopharyngeal reflux and side effects of the inhaled corticosteroids may be responsible for the voice disorders [5,6,16].

To the best of our knowledge, this is the first study to examine the subjective evaluation of children with asthma using p-VHI and to compare the results with healthy controls. In the current study, it was also shown that as the severity of asthma increased, so did the pVHI scores. Laryngitis, prolonged cough, high doses of inhaled corticosteroids use and accompanying asthma comorbidities such as chronic rhinosinusitis may explain these symptoms [20-22]. The medications especially inhaled corticosteroids used by the participants in this study did have a significant connection to frequently occurring voice complaints. Fifty- four percent of our asthmatic children were using ICS in our study. The severity of voice disturbances may be increased due to increased inhaler corticosteroid dose. There are numerous reports in the literature on dysphonia in patients using ICS [7-9]. The use of inhaled steroids affects the phonation even in healthy individuals, not only in asthmatics. Sahrawad et al. [23] reported that inhaled corticosteroids (ICS) has a short-term detrimental effect on

Table 1. Clinical and demographic characteristics of patients

	Children with asthma (n=91)	Healthy children (n =79)	p
Gender(F/M)			0.603*
Female	39	37	
male	52	42	
Age (year)	11.67±3.12	11.73±3.49	0.838**
Allergic sensitization			
House dust mites	24(26.4.%)		
Pollen	21(23.1%)		
Mould mixture	4(4.4%)		
Pets	4(4.4%)		
Multipl allergy	37(40.7%)		
Asthma severity			
Mild asthma	38 (41.8%)		
Moderate asthma	35 (38.5%)		
Severe asthma	18 (19.8%)		
Asthma medication			
Montelukast	6 (6.7%)		
Inhaled corticosteroids	49 (54.4%)		
Combination therapy of inhaled corticosteroids and montelukast	19 (21.1%)		
Combination therapy of inhaled corticosteroids and long-acting $ß_2$-agonists	4 (4.4%)		
Asthma without medication	12 (13.3%)		

*Chi-square test, ** Mann-Whitney U test, significance at p<0.05

Table 2. A comparison of the mean scores of the Turkish-pVHI in children with asthma and healthy children

Scale	Children with asthma(n=91)		Healthy children (n=79)		P Value
	mean±SD	Minimum-maximum	mean±SD	Minimum-maximum	
pVHI -F	4.73±4.34	0-21	2.37±3.00	0-16	<0.001
pVHI -P	6.02±5.50	0-22	2.81±4.39	0-17	<0.001
pVHI -E	2.49±3.67	0-18	1.29±2.49	0-14	=0.007
pVHI Total	13.12±11.81	0-54	6.43±8.49	0-47	<0.001

pVHI, Pediatric Voice Handicap Index; pVHI –F, p-VHI functional, pVHI –P, p-VHI physical, pVHI –E, pVHI emotional, P value is for Mann-Whitney U test

Table 3. Comparison of the severity of asthma with pVHI values

	Mild asthma		Moderate asthma		Severe asthma		P value
	Mean±SD	Minimum-maximum	Mean±SD	Minimum-maximum	Mean±SD	Minimum-maximum	
pVHI Total	8.82±6.70	0-27	12.11±8.05	0-32	24.82.±18.55	0-54	0.001
pVHI -F	3.42.±3.18	0-10	4.72±3.67	0-14	7.59±6.34	0-21	0.08
pVHI -P	4.18±4.21	0-18	5.57±4.14	0-19	11.06±7.44	0-22	0.006
pVHI -E	1.5±2.11	0-8	1.74±2.44	0-8	6.24±5.79	0-18	0.001

pVHI, Pediatric Voice Handicap Index; pVHI –F, pVHI-functional, pVHI –P, pVHI-physical, pVHI –E, pVHI-emotional, P value is for Kruskal-wallis test

various acoustic properties of voice on healthy persons. These effects were more evident in connected speech compared to isolated vowel productions.

This study had some limitations. First is that our results are from a relatively small group (n=91). Second is that no further objective tests could be performed due to technical conditions. Subjective voice disorders were analyzed using only the Turkish- pVHI.

Conclusion

Based on the results of our study, the Turkish-pVHI seems to be a useful subjective tool for clinicians to assess voice disorders in children with asthma. Higher pVHI scores were observed in our asthmatic children. As the severity of asthma increased, pVHI scores were increased. Our findings suggest that children with asthma would have more subjective voice disorders than healthy children. We recommend future studies with larger populations to further explore this. Therefore, clinicians should be more aware of voice disorders developing in children with asthma.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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